

What is claimed is:

[Claim 1] A detonator assembly, comprising:

a capacitor;

an initiator mechanically and electrically connected to the

5 capacitor;

a transformer mechanically and electrically connected to the capacitor; and

an addressable chip mechanically and electrically connected to the transformer,

10 wherein the capacitor, initiator, transformer, and addressable chip form an integrated detonating unit.

[Claim 2] The detonator assembly of claim 1, further comprising a capacitor discharge unit, the capacitor discharge unit comprising the capacitor and a resistor.

15 **[Claim 3]** The detonator assembly of claim 2, wherein the capacitor discharge unit further comprises a thick-film circuit that electrically connects the capacitor and the resistor.

[Claim 4] The detonator assembly of claim 3, wherein the resistor comprises a bleeder resistor formed by thick-film
20 deposition, the bleeder resistor adapted to bleed charge from the capacitor.

[Claim 5] The detonator assembly of claim 4, wherein the resistor comprises a charging resistor formed by thick-film
25 deposition, the charging resistor adapted to receive a charging voltage for the capacitor.

[Claim 6] The detonator assembly of claim 2, wherein the capacitor discharge unit further comprises an integrated

micro-switch, the micro-switch adapted electrically to couple the charge from the capacitor to the initiator when activated.

[Claim 7] The detonator assembly of claim 6, wherein the micro-switch comprises one of a microelectromechanical system switch, a bistable microelectromechanical switch, a spark gap switch, a switch having nanotube electron emitters, a MOSFET, and an IGFET.

[Claim 8] The detonator assembly of claim 1, wherein the initiator comprises one of a semiconductor bridge, exploding bridge wire, and exploding foil initiator.

[Claim 9] The detonator assembly of claim 2, wherein the initiator comprises an exploding foil initiator fused directly to the capacitor discharge unit.

[Claim 10] The detonator assembly of claim 1, further comprising an explosive proximate the initiator.

[Claim 11] The detonator assembly of claim 2, wherein the capacitor is fabricated from a dielectric ceramic material.

[Claim 12] The detonator assembly of claim 2, wherein the resistor is selected from the group consisting of a thick-film resistor and a thin-film resistor.

[Claim 13] The detonator assembly of claim 1, wherein the transformer is a piezoelectric transformer.

[Claim 14] The detonator assembly of claim 1, further comprising a second transformer adapted to generate a trigger pulse to fire the initiator.

[Claim 15] The detonator assembly of claim 1, wherein the addressable chip is adapted to identify one or more initiators from a set of initiators.

5 [Claim 16] The detonator assembly of claim 15, wherein the addressable chip is adapted to selectively charge one or more initiators from the set of initiators.

10 [Claim 17] The detonator assembly of claim 15, wherein the addressable chip is adapted to selectively delay for a predetermined time the charging of one or more initiators from the set of initiators.

[Claim 18] The detonator assembly of claim 15, wherein the addressable chip is adapted to selectively fire one or more initiators from the set of initiators.

15 [Claim 19] The detonator assembly of claim 15, wherein the addressable chip is adapted to selectively delay for a predetermined time the firing of one or more initiators from the set of initiators.

[Claim 20] The detonator assembly of claim 1, wherein the addressable chip is adapted to inactivate the initiator.

20 [Claim 21] The detonator assembly of claim 1, wherein the addressable chip is adapted to activate a sensor.

[Claim 22] The detonator assembly of claim 21, wherein the sensor is a pressure sensor.

25 [Claim 23] The detonator assembly of claim 21, wherein the sensor is a temperature sensor.

[Claim 24] The detonator assembly of claim 21, wherein the sensor is a tilt-angle sensor.

[Claim 25] The detonator assembly of claim 21, wherein the sensor is a current sensor.

[Claim 26] The detonator assembly of claim 21, wherein the sensor is a voltage sensor.

5 [Claim 27] The detonator assembly of claim 21, wherein the sensor is a radio frequency sensor adapted to detect radio frequency identification tags.

[Claim 28] The detonator assembly of claim 1, wherein the addressable chip is adapted to disconnect a bottom-fired
10 initiator from a string of initiators.

[Claim 29] The detonator assembly of claim 1, further comprising a housing adapted to hold the detonating unit.

[Claim 30] The detonator assembly of claim 29, wherein the housing has an outer diameter of approximately 0.28 inches.

15 [Claim 31] The detonator assembly of claim 29, wherein the housing is adapted to couple with a detonating cord having a predetermined diameter.

[Claim 32] The detonator assembly of claim 31, wherein the housing has an outer diameter substantially equal to the
20 diameter of the detonating cord.

[Claim 33] A method of fabricating an integrated detonator, comprising:

providing a capacitor discharge unit;

mechanically and electrically connecting a transformer to the

25 capacitor discharge unit;

mechanically and electrically connecting an addressable chip to the transformer; and

electrically connecting a micro-switch and initiator to the capacitor discharge unit.

[Claim 34] The method of claim 33, wherein providing a capacitor discharge unit comprises mechanically and
5 electrically connecting a resistor and a capacitor.

[Claim 35] The method of claim 33, further comprising providing an explosive proximate the initiator.

[Claim 36] A jet cutter, comprising:

10 a first explosive material formed intimately against a metallic liner; and
a detonator assembly substantially embedded in the first explosive material, the detonator assembly comprising an initiator, a capacitor, and a second explosive material proximate the initiator.

15 [Claim 37] The jet cutter of claim 36, wherein the initiator and capacitor are fused or bonded together to form a single unit.

[Claim 38] The jet cutter of claim 36, wherein the capacitor is located external to the first explosive material, and wherein
20 the initiator and capacitor are electrically connected together by a cable.

[Claim 39] A shaped charge, comprising:

a first explosive material formed intimately against a metallic liner; and
25 a detonator assembly comprising an initiator, a capacitor, and a second explosive material proximate the initiator,

wherein the second explosive material is in direct contact with the first explosive material.

5 [Claim 40] The shaped charge of claim 39, wherein the initiator and capacitor are mechanically connected to form an integrated unit.

[Claim 41] The shaped charge of claim 39, wherein the capacitor is located external to the first explosive material, and wherein the initiator and capacitor are electrically connected together by a cable.

10 [Claim 42] A detonator assembly, comprising:
a capacitor discharge unit, the capacitor discharge unit comprising a charging resistor, a bleeder resistor, and a capacitor mechanically and electrically connected together;
an initiator mechanically and electrically connected to the
15 capacitor discharge unit, the initiator selected from the group consisting of an exploding foil initiator, an exploding bridge wire, a semiconductor bridge, and a hot wire;
a micro-switch mechanically and electrically connected to the capacitor discharge unit and the initiator;
20 an initiating explosive proximate to the initiator; and
a housing adapted to hold the capacitor discharge unit, the initiator, the initiating explosive, and the micro-switch together to form an integrated detonating unit.

25 [Claim 43] The detonator assembly of claim 42, further comprising:

an addressable chip;
a protection filter electrically connected to the addressable chip; and

a first transformer mechanically and electrically connected to the addressable chip and the capacitor discharge unit,
wherein the addressable chip, protection filter, and first
5 transformer are located within the housing.

[Claim 44] The detonator assembly of claim 43, further comprising a second transformer electrically connected to the micro-switch, the second transformer adapted to generate a trigger pulse to fire the initiator.

10 [Claim 45] A method for use in a wellbore, comprising:
providing a capacitor, an initiator, a micro-switch, an addressable chip, a transformer, and an initiating explosive mechanically and electrically connected together to form an integrated detonating unit;
15 connecting the integrated detonating unit to an explosive tool;
deploying the explosive tool in the wellbore; and
firing the initiator to activate the explosive tool.

20 [Claim 46] The method of claim 45, wherein the explosive tool is a jet cutter.

[Claim 47] The method of claim 45, wherein the explosive tool is a shaped charge.

[Claim 48] The method of claim 47, further comprising:
selecting the shaped charge to fire from a plurality of
25 shaped charges deployed in the wellbore.

